Northwest Region
7600 Sand Point Way, N.E.
Bin C15700, Bldg. 1
Seattle, Washington 98115-0070

October 4, 1996 F/NW

Re: Working Guidance for Comprehensive Salmon Restoration Initiatives on the Pacific Coast

Dear Partners and Stakeholders:

There is growing movement toward, and a clear need for, a cohesive and cooperative approach to conservation of Pacific salmonids that are of concern under the Endangered Species Act. The enclosed document is the National Marine Fisheries Service's (NMFS) attempt to describe the important elements of a coastal salmonid restoration plan. We hope that it will help those involved understand the issues and approaches that NMFS believes are critical to the ultimate success of coastal salmonid restoration.

This is a working document and is not carved in stone. We welcome ongoing comments and suggestions on how to strengthen or improve the guidance, as we continue working as closely as possible with the many sovereign entities and interested parties to develop an effective conservation strategy for the region's salmonids.

Comments, questions, or suggestions may be directed to

Anne Squier
NMFS - NWR Portland Office
525 NE Oregon, Suite 500
Portland, OR 97232-2737
(Tel. 503/230-5406)
(Fax 503/230-5435)

OR TO

Patrick Rutten
NMFS - SWR Santa Rosa Office
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404
(Tel. 707/575-6059)
(Fax 707/578-3435)

Sincerely,

William Stelle, Jr.
Regional Administrator

Enclosure

COASTAL SALMON CONSERVATION:

WORKING GUIDANCE FOR COMPREHENSIVE SALMON RESTORATION INITIATIVES ON THE PACIFIC COAST

September 15, 1996

COASTAL SALMON CONSERVATION:

WORKING GUIDANCE FOR COMPREHENSIVE SALMON RESTORATION INITIATIVES ON THE PACIFIC COAST

This is a working document developed by the Northwest and Southwest Regions of the National Marine Fisheries Service. We welcome comments and suggestions on how to strengthen or improve the guidance, as we continue working as closely as possible with the many sovereign entities and interested parties to develop an effective conservation strategy for the region's salmonids.

Comments, questions, or suggestions may be directed to

Garth Griffin
NMFS - NWR Portland Office
525 NE Oregon, Suite 500
Portland, OR 97232-2737
(Tel. 503/231-2005)
(Fax 503/230-5435)

OR

Patrick Rutten
NMFS - SWR Santa Rosa Office
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404
(Tel. 707/575-6059)
(Fax 707/578-3435)

TABLE OF CONTENTS

I. Context and Purpose of the Guidance

The National Marine Fisheries Service (NMFS) has drafted this guidance to assist the Pacific Coast states, tribes, and other entities in taking the initiative for coastal salmon restoration. The NMFS is completing comprehensive status reviews on six species of salmonids on the Pacific Coast. The NMFS has found many Evolutionarily Significant Units (ESUs)[1] to be so severely depressed that they have been (or are likely to be) proposed for listing by the Secretary of Commerce as threatened or endangered under the Endangered Species Act (ESA). Immediate, aggressive actions are needed to protect these coastal salmonids from further declines, as well as sustained planning and actions to rebuild and maintain them over the long term.

The pacific coastal states, tribes, and local entities have expressed determination to avert extinctions and rebuild coastal salmonid stocks by implementing coastal salmonid restoration strategies or through other means. The NMFS supports these efforts and will cooperate with these entities as initiative strategies are developed and implemented.

The three overarching components of a successful restoration strategy, discussed in detail below, are:

a) its substantive protective and conservation elements;

b) a high level of certainty that the strategy will be reliably implemented, including necessary authorities, commitments, funding, staffing, and enforcement measures; and

c) a comprehensive monitoring program.

Success in restoring coastal salmon populations will ultimately mean:

- increased abundance of naturally spawned fish in ESUs to self-sustaining levels, not at risk of extinction;

- broad distribution of naturally spawned fish within each ESU; and

- genetic diversity in a pattern and at levels consistent with natural evolutionary processes, both within and among ESUs.

[1] Evolutionarily Significant Units are defined by NMFS policy to be equivalent to "distinct population segments" which are treated as "species" under the ESA.

Under the ESA, the determination whether to list a species as threatened or endangered must take into account any efforts being made by a state or other entity to protect that species. An adequate restoration plan could provide a basis for NMFS to decide that it is not necessary to list one or more salmonid ESUs as threatened or endangered. Even if listing proves necessary, such a plan may allow NMFS to determine that ESUs are threatened but not endangered. If an ESU must be listed as threatened, a plan could provide a good base from which to establish a framework of conditions under which economic activities may continue without being considered an unlawful "taking."[2]

Under its Endangered Species Act (ESA) responsibilities, NMFS must protect and recover salmonids that are at risk of extinction now or in the foreseeable future. Under the Magnuson Fisheries Conservation and Management Act, NMFS has a responsibility to foster and manage healthy, sustainable commercial and recreational fisheries. **This guidance identifies the critical elements of a plan that NMFS can weigh in the balance as it makes listing decisions according to ESA requirements.**[3]

Certainly if any co-manager wishes to move beyond designing a strategy for recovery of a depressed stock to include steps necessary to assure a strong commercial and recreational fishery, NMFS will likewise cooperate and collaborate in that effort. This guidance, however, is directed to NMFS' ESA responsibilities. Our common regional goal of achieving long-term sustainable fisheries cannot be attained in the absence of a

[2] Current state efforts have been variously referred to as "restoration," "conservation" or "recovery" plans. This guidance speaks generically to plans for restoration and protection of salmonids, and reserves the terms "conservation plan" or "recovery plan" for use to describe specific ESA tools. Under section 4(f) of the ESA, the Secretary is to develop "plans ... for the conservation and survival" of listed species. Section 4(f) refers to these as "recovery plans."

Under ESA section 10, incidental take permits may be issued only if an applicant submits an adequate "conservation plan," for clarity generally referred to as "habitat conservation plans" or "HCPs."

Although not specifically called out within the ESA, the Fish and Wildlife Service has utilized "Conservation Agreements" to provide a basis for decisions about listing.

A comprehensive strategy could well serve as the basis for a Conservation Agreement; serve as the substantive framework of a recovery plan; or become the springboard for one or more HCPs. Whether a restoration initiative in fact can or does serve one or more of those functions cannot be determined in a general guidance document.

[3] The elements identified in this guidance to a large degree also describe the elements that would make up a recovery plan for a listed species.

strong, coastwide action to recover and maintain wild salmon populations and the ecosystems upon which they depend.[4]

The NMFS strongly encourages the states, tribes, and others to develop plans that address the needs of all depressed coastal salmon ESUs, many of whose habitats overlap. An ecosystem approach which benefits many aquatic species is supported by the ESA, which has as one of its express purposes to "...provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved...." Conservation plans which protect and restore the ecosystem upon which multiple listed species depend are also desirable because they are likely to be the most efficient and cost-effective to implement.

However, NMFS recognizes that a state may find it more practical to complete a plan for one species and then expand or supplement it for other species. Obviously, all efforts and plans should seek to avoid adversely affecting other listed or candidate species.

The NMFS recognizes that a "state" coastal salmon conservation plan can be a mosaic of conservation measures undertaken in a spirit of cooperation by the state and Federal agencies, tribes, local governments, local watershed councils, and private landowners. The states and tribes can provide the leadership and organization needed to assemble these composite parts into an overall strategy, identify and supply missing elements, and frame the necessary monitoring and assessment procedures. The common elements linking the pieces of the mosaic of a "state" plan include state and Federal regulations, the salmon and their habitat, and a shared commitment to, and enthusiasm for, bringing salmon back from the brink of extinction. In that spirit, we offer this draft guidance to the Pacific Coast states, tribes, and other entities involved in salmon conservation.

[4] While harvest strategies (and, to a lesser extent, hatchery strategies) necessary to meet ESA needs for depressed populations may be vastly different from those appropriate for a recovered population that can sustain a robust fishery, the NMFS cautions against extrapolating that relationship to habitat strategies, at least for the foreseeable future. Put in simplest terms, hatchery and harvest strategies can be "turned on and off" quickly, and the results seen and evaluated relatively quickly (one to a few years). That is generally not true for habitat strategies, which produce improvements over many decades. Hence our ability to "fine-tune" habitat strategies, or to adjust them based on outcomes, lies years in the future.

Especially for habitat strategies, full recovery (to a point free of substantial risk of near-term decline toward threatened status) depends on reestablishing long term natural processes to a point that can sustain necessary habitat characteristics over the broad landscape. Given the decades (or longer) this will require, any attempt to draw a crisp line today defining how much habitat is necessary for full recovery of populations would be premature.

Finally, quite aside from ESA requirements, restoring those habitat functions over the long term will be vital to meeting treaty fishery obligations.

II. Critical and Desirable Elements

If NMFS is to take a comprehensive salmon restoration plan into account in its ESA decisions, it is important that the strategy substantively:

1. Identify at appropriate scales the factors that have contributed to decline of the ESU(s).

2. Establish priorities for action.

3. Establish explicit objectives and timelines for eliminating or reducing all major factors for decline and for achieving desired population characteristics.

4. Establish quantifiable criteria and standards by which progress toward each objective will be measured.

5. Adopt measures (actions) needed to achieve the explicit objectives. A plan should include measures to protect and restore habitat wherever habitat condition is a factor of decline, whether on private or public lands.

Equally important, the state must clearly demonstrate that it:

6. Provides high levels of certainty that the identified measures and actions will be reliably implemented, including necessary authorities, commitments, funding, staffing, and enforcement measures.

Finally, fundamental to a complete restoration strategy is to:

7. Establish a comprehensive monitoring program, including methods to measure whether objectives are being met and to detect population declines and increases in each ESU.

The NMFS believes success of a strategy will be enhanced if it also:

8. As much as possible, integrates Federal, state, tribal, local, corporate, and nongovernmental activities and projects that are designed to recover salmon populations and the habitats upon which they depend.

9. Utilizes an adaptive management approach that actively shapes management actions to generate needed information.

III. Description of Elements

1. Identify at appropriate scales the major factors that have contributed to decline of the ESU(s).

Natural factors such as climate and ocean conditions cause fluctuations in populations through time. When salmon were abundant, well-distributed throughout their range, and genetically diverse, salmon populations were sufficiently resilient to tolerate variations in climate and ocean conditions, natural predation, diseases, and localized catastrophes (such as landslides which can completely block access to spawning or rearing areas, or channelized debris flows that scour spawning areas down to bedrock) without widescale extinctions. Our challenge is to control the human-caused factors for decline in order to restore the resilience of salmon populations.

Scientists and resource managers agree that multiple human-induced factors contribute to decline of coastal salmonids. The primary factors for decline vary from basin to basin, between watersheds, and to some extent between ESUs, and must be identified at the appropriate scales.

The factors for decline also vary for different life stages. To ensure that an adequate number of salmon survive to reproduce as adults, every life stage must be protected. For example, it would be futile to improve rearing habitat if severe physical barriers prevented downstream or upstream migration, or if all of the adults were harvested before they reproduced.

The factors for decline that are within human control include habitat modification and destruction, harvest, hatchery practices, and introduction of non-native species. A number of studies present more detailed discussion of how habitat factors of decline (such as forestry, grazing, agriculture, mining, dams and water withdrawals, hydropower, urbanization, transportation activities, estuary development, and cumulative effects) affect salmonids. Many of these are listed as references within Appendix II.

2. Establish priorities for action.

Restoration plans should identify priorities for the measures and actions the plan identifies as necessary. These priorities should be selected to halt any further declines of listed or at-risk species and provide the greatest likelihood of their recovery and long term health.

Priorities will serve as a backbone of an effective coordination strategy uniting local, state, tribal, and Federal efforts to recover listed or at-risk salmonid ESUs coast- and region-wide.

Prioritization should focus initial efforts, staff, voluntary contributions, and other resources. The need for prioritization is most apparent with respect to habitat issues, but can also serve to help focus hatchery and harvest measures or the monitoring of their effectiveness.

Prioritization should result in a list of the specific geographic and biological units within an ESU that will receive the most immediate or most complete protection or restoration in the short-term. Priorities may be defined by biological units (population or subpopulation) or by geography (basin, subbasin, watershed, stream reach, or "core area"). In general, spawning and rearing areas that consistently yield the highest concentrations of fish should be identified as a high priority for protection. Healthy salmon populations in these areas will serve as building blocks for the recovery of other populations in an ESU. In addition, attention should be given to prioritizing adjacent areas (e.g., migration corridors and estuarine habitats) that may pose a bottleneck to successfully linking all life stages of these priority population units. Such bottlenecks can occur if environmental conditions (e.g., elevated stream temperatures) or management measures (e.g., harvest) prevent key units from achieving full productivity.

Priorities should identify places and biological units for which rapid progress toward meeting objectives is especially important to ensure recovery. At the watershed or stream reach scale, limiting factors for salmonid production should define priorities.

Strategies should place a high priority on the following:

1. ESUs, or key subpopulations, that are at very high risk, based on status review information, state fish and game agency population data, habitat surveys, and published reviews. For example, in Oregon, Umpqua searun cutthroat trout are a high priority, based on their status as "endangered."

2. Existing highly productive, or potentially highly productive, areas within watersheds of listed or at-risk ESUs (sometimes labeled "core areas"). These areas need to be identified and given a high level of protection from potentially damaging activities. Protection should focus on maintaining essential functions of the mainstem and tributary spawning and rearing areas, and conditions in the migration corridors that allow for safe passage, both upstream and downstream, of adults and juveniles.

3. Basins, subbasins or watersheds that support multiple salmonid species or ESUs, and that would benefit most from targeted attention to specific limiting factors, i.e., where

protection and restoration actions have a high potential to substantially improve productivity. The potential to improve productivity should include the value from recolonization by salmon populations from currently isolated functional habitats. For example, the Rogue and Umpqua Rivers in Southwestern Oregon support multiple at-risk ESUs, were historically very productive, and have a high potential to benefit from habitat restoration (including water quality improvements). Appendix I illustrates an approach to identifying key basins for coho, using Oregon as an example.

4. Limiting factors which are particularly severe. States, tribes, and others are encouraged to identify limiting factors which would be targeted within specific ESUs, basins, and watersheds.

3. Establish explicit objectives and timelines for correcting factors for decline and achieving desired population characteristics.

A coastal salmon restoration plan should establish clear objectives for salmon population characteristics and for habitat, hatchery practices, harvest, and control of non-native species that will collectively ensure protection and recovery of the ESU(s) it covers. A timeline for achieving objectives should also be identified. Parts IV and V lay out in detail objectives NMFS believes are important to success in the habitat, hatchery and harvest areas.

4. Establish quantifiable criteria and standards by which progress toward each objective will be measured.

A coastal salmon conservation plan should also identify quantifiable criteria or standards that the state, tribes, and others will use to track how well plan measures (actions) are achieving objectives. One example would be the use of selected water quality standards as a way of measuring progress toward creating favorable habitat characteristics for salmon. In appropriate circumstances, size or growth rate of naturally produced smolts could be used to measure progress toward halting adverse hatchery impacts on wild salmonid stocks.

5. Adopt measures (actions) needed to achieve the explicit objectives. A plan should include measures to protect and restore habitat wherever habitat condition is a factor of decline, whether on private or public lands.

Salmon restoration plans should identify the measures (actions) that will advance the plan's explicit objectives. The measures form the substantive core of the plan. While the Federal government has placed a high priority on recovering at-risk species on public lands, actions on public lands alone cannot recover Pacific salmon because so much of their habitat flows through private lands. For example, from 50 to 90 percent of land in coho ESUs is private.

6. Provide high levels of certainty that the identified measures and actions will be implemented, including necessary authorities, commitments, funding, staffing, and enforcement measures.

The NMFS recognizes that a strategy for restoring or recovering a depressed, threatened or endangered stock can never provide certainty of result. But for NMFS to rely on a restoration strategy either as a factor in listing decisions, as a foundation or building block for a recovery plan, or in conjunction with other administrative tools[5] the plan must provide assurance that its elements will be funded and implemented on a predictable time schedule that sets explicit milestones for accomplishing key measures and achieving objectives. That assurance will require identification of adequate staff resources, and a demonstration of necessary control and authorities.

The strategy also should show how and by whom effectiveness of various elements will be monitored. Finally it must demonstrate that there will be widespread and rigorous enforcement of existing local, state, and Federal regulations.

For each of its elements or strategies, the plan should identify
- Who is responsible for implementation (state or Federal agency, tribe, local jurisdiction, landowner, volunteer group);
- How necessary funding/staff have been or will be obtained;
- For voluntary measures, how the state projected the number/extent of implementation actions to occur through voluntary effort, and what assurances there are that the actions will occur;
- How and by whom implementation will be monitored and assessed;
- How and by whom the effectiveness of plan elements will be monitored and assessed, and how necessary adjustments in plan elements will be affected.

7. Establish a comprehensive monitoring and reporting program, including methods that measure whether objectives are being met and detect subpopulation declines and increases in each ESU.

Salmon restoration plans need a comprehensive, peer-reviewed monitoring program to detect population increases towards recovery (or further declines) and to determine whether

[5] Those administrative tools include section 10 habitat conservation plans, 4(d) rules, and section 6 cooperative agreements.

population density, distribution and genetic diversity objectives are being met on schedule. That program must identify how information gathered will be integrated and synthesized so that NMFS and others can track the outcomes of various measures.

Plans that focus on units smaller than ESUs, such as "gene conservation groups," will need to tailor criteria for success and monitoring strategies to those scales. Collaborative identification of appropriate index stocks, monitoring sites, and statistically rigorous counting methods will allow NMFS and the states to track and evaluate subpopulation trends in each ESU annually.

Plans also need monitoring programs to track the extent to which plan measures and actions have been implemented and how effectively they are meeting habitat, hatchery, and harvest objectives using explicit standards or criteria. Monitoring programs need to provide information for tracking progress at all scales, from the reach and watershed scale to the ESU and landscape scales. A comprehensive monitoring program should identify monitoring sites or clear site-selection criteria, methods, frequencies of data collection, data evaluation methods, and reporting plans.

Well designed monitoring is also needed to carry out adaptive management. A number of large scale monitoring efforts underway on the Pacific coast can be integrated into state and tribal monitoring programs. A coastwide, or at least statewide, team of Federal, state, tribal, and industry staff and managers should convene to address how to maximize the value from existing and planned monitoring efforts. Agreement on standardized or compatible data formats, monitoring methodology and equipment, GIS data bases, computer analyses, modelling, maps, and other products will increase efficiency and cost-effectiveness.

8. As much as possible, integrate Federal, state, tribal, local, corporate, and nongovernmental activities and projects that are designed to recover salmon populations and the habitats upon which they depend.

Ideally, a coastal salmon restoration plan will coordinate the contributions from Federal, state, tribal, and local governments, as well as from landowners and other nongovernmental entities, including community-based watershed groups. Integration of diverse efforts is important for four reasons. First, that coordination will make it much clearer whether all needed elements of restoration are being attended to. Second, when the measures and authorities are welded together into a solid framework, there is less chance of duplicating efforts. Third, an integrated plan allows all involved parties to use their strengths to the best advantage and shore up any inherent programmatic weaknesses. Finally, salmon restoration requires attention at the landscape scale, the ESU scale, and the local (basin or watershed) scale, each of which is a focus for certain groups, agencies, or parties, but none of which should be pursued unconnected with the whole.

The landscape scale encompasses coast-wide and state-wide perspectives. A coast-wide perspective can address the fact that salmonid migration ignores state boundaries, and that potential factors of decline such as ocean harvest and habitat alteration tend to be very far-reaching in their effects.

Each state, along with the Federal government, has unique statutory authorities and programs, including explicit salmon management and protected species responsibilities, that can be woven together to provide the framework for salmon restoration. The Oregon Coastal Salmon Restoration Initiative, the California Coastal Salmon Natural Community Initiative, the implementation phase of Washington's Wild Salmonid Policy (Wild Salmonid Restoration Initiative), the Pacific Salmon Task Force, the Pacific Salmon Coordinating Committee, and the Northwest Forest Plan can all provide components of an integrated landscape-scale restoration effort.

The next tiered geographic scale is that of the ESU. ESUs, based not on political boundaries but on the biology of the salmon, are the most critical management unit for salmon recovery. Conservation efforts must be evaluated in the aggregate on their success in restoring and sustaining ESUs. Ultimately the question is not whether every individual run within an ESU can be maintained, but whether enough subpopulations, and the right subpopulations, are protected so as to recover the numbers and distribution of salmon in the ESU and to maintain the genetic diversity of the ESU. Determination of how many and which subpopulations this involves will involve discussions among state and Federal fishery biologists.

However, it can be useful to identify and manage smaller biologically-based conservation units, an approach often more comparable to the units generally considered by fishery managers. Both Oregon and Washington have undertaken to identify such smaller units, called "gene conservation groups" or similar names. Conservation measures developed for gene conservation units will, if successful, aggregate to result in a healthy and whole ESU.

The last scale to address is based on "local" hydrogeographic units, the basins, subbasins, watersheds, and in some cases river or stream reaches. Because the ESA calls for protection of the <u>ecosystems</u> upon which species depend, hydrogeographic units must be considered in their entirety. At the watershed level, tribes, local government, businesses, private land owners, and citizen groups will play a major role in planning for and implementing actions necessary for salmon recovery.

Success of a restoration effort will depend heavily upon the extent to which all of the scales are woven into a coordinated whole. At the ESU level, coordination is needed to decide whether to take a single-species or multispecies approach; to deal with interstate issues when a listed or at-risk ESU crosses state lines; and to ensure that efforts will, in the aggregate, recover the ESU. At the basin, subbasin, and watershed levels, coordination will allow focus on protecting core areas, eliminating habitat fragmentation, and overcoming limiting factors.

Existing fora have the potential to enhance coordination. For example, the "For the Sake of the Salmon" coalition is helping to foster communication and coordination between Federal, state, tribal, community, public interest and private sector organizations, and private landowners, at the general policy level. The Northwest Forest Plan Provincial Advisory Councils composed of Federal, state, local government and citizen representatives can help with respect to managing certain Federal lands. The Federal Natural Resource Conservation Service (NRCS) provides technical assistance to help farmers and ranchers develop conservation systems uniquely suited to their land and individual ways of doing business. The NRCS also provides assistance to rural and urban communities to reduce erosion, conserve and protect water, and solve other resource problems. At the watershed scale, many watershed councils and conservancies have been constituted to identify, implement, and coordinate protection and restoration efforts.

States are better equipped than is NMFS to define how broad coordination that includes watershed level entities, and that addresses technical and regulatory issues as well as policy, can best be achieved. The essential point is that restoration of coastal salmonids will be more likely to succeed if managers and stakeholders have a clear understanding of the overall framework within which they are working, and if that framework is used to be sure that all necessary steps are addressed in as efficient a manner as possible.

9. Utilize an adaptive management approach that actively shapes management actions to generate needed information.

Development and implementation of coastal salmon restoration plans will crystallize some fundamental questions which, if answered, would improve our ability to manage salmon habitat and salmon. Many actions will necessarily proceed in the face of considerable uncertainty.

Therefore, plans should incorporate feedback loops to adapt measures and actions as new information suggests ways to improve the likelihood of avoiding extinction and rebuilding salmonid populations. Adaptive management is not simply a passive strategy that relies upon whatever information becomes available to alter management decisions and directions. Under adaptive management, actions are structured to generate needed information.

Adaptive management relies on scientific method to test the results of actions taken so that management and related policy can be changed promptly and appropriately. Questions and study protocols should be refined by teams of regional or coastwide managers and scientists.

IV. Habitat Elements

Salmon populations along coastal regions of California, Oregon, and Washington have been severely reduced by a number of factors, including hydropower operations, overexploitation in mixed stock fisheries, artificial propagation, climatic and oceanic changes, and destruction and degradation of habitat through land-use and water-use practices. Although the relative impacts of these different factors on salmon vary among populations, basins and watersheds, habitat loss and degradation due to activities within human control are important contributing factors in the decline of most anadromous salmonid populations.

Conservation activities at the individual landowner, watershed, state, and Federal levels will be most effective if woven into an overall, regional habitat and salmon restoration program. Spence (in press) developed five broad biological and ecological goal statements that are central to salmon conservation. The NMFS provides these five objectives as part of a comprehensive framework appropriate for conservation or recovery habitat plans that will maintain (where adequate) and restore (where inadequate) ecosystem processes and functions. These objectives are consistent with the somewhat more specific Aquatic Conservation Strategy Objectives in the Northwest Forest Plan and the Ecological Objectives contained in the Land and Resource Management Plan Biological Opinion (both included in Appendix II).

Objective 1. Maintain and restore natural watershed processes that create habitat characteristics favorable to salmonids. It is essential that whole, contiguous landscapes be managed to protect natural <u>processes</u> (i.e., the natural rates of delivery of water, sediment, heat, organic materials, nutrients, and other dissolved materials), rather than to achieve a specific <u>state</u>. Ecosystems are dynamic, evolving entities that must be managed to retain their capacity to recover from natural disturbances (e.g., climate change, fire, disease, floods). Therefore, active, in-channel habitat restoration should not be the main focus of restoration efforts. It may be needed in severely degraded systems where failure to act will cause irreparable harm to habitat or to salmon, but should never substitute for addressing the causes of the degraded condition.

Objective 2. Maintain habitats required by salmonids during all life stages from embryos and alevins through adults. The complex life histories of salmonids demand a wide array of habitat types. Different portions of a watershed may accommodate spawning and rearing habitat, and the needs of the species vary. Large lowland rivers are important migration corridors for fish on their way to and from the sea. These migration routes must be ecologically healthy with high water quality, the physical attributes required for holding, feeding, or hiding, as well as the biological elements favorable to salmonids during these physiologically demanding transition periods.

Objective 3. Maintain a well-dispersed network of high-quality refugia to serve as centers of population expansion. Conservation biology suggests that the most fundamental goal of species and ecosystem protection is to preserve those habitats that retain a high degree of ecological integrity. Populations within these "healthy" habitats have the greatest probability of surviving natural disturbance events or long-term shifts in environmental conditions.

Objective 4. Maintain connectivity between high-quality habitats to allow for reinvasion and population expansion. The high degree of landscape fragmentation that has resulted from human activities has left many salmonid populations in relative isolation. Long-term persistence of salmonid metapopulations depends on developing connectivity between subpopulations through restoration and maintenance of corridors so that these populations can interact in a natural fashion.

Objective 5. Maintain genetic diversity. Maintaining genetic diversity and integrity within and among salmonid stocks and species is an important objective of both hatchery and harvest management, but cannot be achieved without well-dispersed, properly functioning habitat.

In sum, an effective strategy to address habitat protection and restoration involves complex spatial and temporal issues. We have displayed the substantive, process, and information issues in **Table 1**, which illustrates the geographic scales at which they operate.

Table 1. Components of a Habitat Plan for Recovery and the Scale at Which They Occur

Habitat Recovery Plan Components	Scale on the Landscape							
	Region	ESU	Basin	Sub-basin	Water-shed	Core Areas	Reach	Site
Substance								
Goals	X							
Objectives		X	X	X	X			
Criteria/Pathways				X	X	X	X	X
Standards/Indicators					X	X	X	X
Measures		X	X	X	X	X	X	X
Priorities		X	X	X	X	X	X	X
Process/Information								
Coordination	X	X	X	X	X	X	X	X
Monitoring		X	X	X	X	X	X	X
Implementation		X	X	X	X	X	X	X
Effectiveness		X	X	X	X	X	X	X
Certainty/Funding	X	X	X	X	X	X	X	X
ESU Analysis	X	X						
Basin Analysis			X					
Watershed Analysis					X			
Adaptive Management	X	X	X	X	X	X	X	X

Objectives, priorities, monitoring, certainty, and adaptive management have been described above in Part III. The following is a brief characterization of other components as they relate specifically to habitat plans.

Criteria

Ecological criteria are the elements that states, tribes, and others should use to determine the effects of proposed measures on habitat quality. The NMFS has identified habitat criteria, or pathways, as: Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow and Hydrology, and Watershed Conditions. A salmon restoration strategy should identify which agencies (and which of their individual programs), affect each of these major pathways. Then, when these programs are implemented at the project or activity level, they should be further evaluated within the context of the ecological pathways in the affected sub-basin and watershed.

Standards

Quantifiable standards, or indicators, are used to evaluate reach- or site-specific actions. At this scale impacts of individual activities can be meaningfully assessed. An example would be specific temperature ranges for coho spawning. Appendix II is a matrix tool NMFS has prepared to help identify criteria/pathways and standards/indicators that are discussed in greater detail below.

Measures

Carefully selected measures (actions) are at the core of a state or other salmon restoration plan. Examples of some measures would be culvert replacement, increased instream flows, revegetation efforts, agricultural waste management, forest road obliteration. Federal agencies also are undertaking substantial measures through the implementation of the Northwest Forest Plan and other efforts. Federal measures include implementation and coordination of regional habitat management strategies on Federal lands, review of Federal permitting and licensing processes, funding efforts, and technical assistance.

Measures may be applied statewide or on a smaller geographic scale such as individual ESUs, basins, watersheds, or even stream reaches. Measures at a watershed scale or smaller should address limiting factors identified at a watershed scale. Each species of at-risk anadromous salmonids has slightly different habitat requirements; thus, limiting factors may differ somewhat from species to species. For example, for coho it would be reasonable to focus immediate efforts on five main areas of concern: increased water temperature (due to reduced stream shading via removing riparian vegetation); increased sedimentation; loss of large woody debris (LWD) in streams, and loss of potential future sources of LWD in riparian areas; reduced access to upstream spawning and rearing areas (due to improperly designed culverts, road crossings, and other human-caused physical barriers); and loss of channel complexity, including pools and off-channel rearing areas (side channels and backwater habitats) needed for overwinter survival.

Restoration and management activities within "core areas" should be carefully limited. Restoration activities should focus on "passive" techniques that protect the ecological functions of core areas, and more "active" (or more aggressive) techniques to reconnect core areas that may have become fragmented, or functionally disconnected from one another. Active restoration practices should focus on bringing degraded areas adjacent to core areas into production to bring about recolonization and population expansion.

The NMFS has developed an "effects matrix" which can be used to evaluate the potential impacts of proposed actions at two distinct levels. The first level is the programmatic scale. At this level the matrix can be used as a guide to ensure that several actions in a program will collectively address all relevant salmon habitat parameters.

At the watershed, reach, and site levels (the second level), the matrix can be used to determine the likely positive or negative effects of proposed restoration actions over a integrated set of habitat parameters. The matrix may also be used to develop a set of environmental baseline conditions for specific areas to help focus on the appropriate restoration activities to achieve objectives.

The matrix is contained in the draft document titled "Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale" (NMFS, August 1996) (Appendix II).[6] The matrix presents a way to quantify the "properly functioning" ranges for several key habitat indicators. The matrix also can provide a consistent, logical line of reasoning to determine when and where adverse effects occur, to identify the factors that limit salmonid production, and to identify restoration and protection priorities. Watershed, reach, and site scales are all appropriate scales to determine limiting factors. The limiting factors should then be used in the prioritization process.

The matrix enables an individual or group to evaluate any measure that affects salmon habitat, either directly, indirectly, or

[6] All extant Federal regional land management guidance documents (Northwest Forest Plan, PACFISH, the Land and Resource Management Plans on the east side of the Cascades, and the Draft Recovery Plan for Snake River Salmon) were taken into consideration in designing the matrix.

cumulatively. A simple modification of this process could be used to evaluate measures on different time scales, e.g. on a short- (5 year), intermediate- (10 year), and long-term (50-100 year) basis. Measures that are likely to produce results on a short or intermediate time frame would be appropriate to protect key habitats and to stabilize populations, while those likely to produce results only on a long time frame are more appropriate to achieve ultimate recovery of salmon populations and the habitats upon which they depend.

A comprehensive framework for understanding salmonid conservation principles in an ecosystem context has been developed by ManTech Environmental Research Services Corporation under contract with NMFS, the United States Fish and Wildlife Service, and the Environmental Protection Agency, and will be available in final form some time in October of 1996. The document is entitled "An Ecosystem Approach to Salmonid Conservation" and it contains one of the most comprehensive reviews of current salmon biology and conservation literature available. The ManTech report is not intended to serve as a decision document, but provides much useful information for developing conservation plans at regional, subbasin, and watershed scales.

The second major group of habitat restoration components addresses process and information needs.

Basin Analysis

Basin Analysis or Assessment is an evaluation of the major ecological processes and interactions, including natural and anthropogenic sources of change, over fairly large, hydrographic areas (i.e., major river basins). Conservation planning for at-risk salmonid ESUs should give special attention to larger basins (e.g., the Columbia River, and the Rogue River and Umpqua River in southwestern Oregon) that historically represented centers of production for many salmon ESUs. Basin analyses should generally be broad and, because of the large land area involved, focus on major, landscape scale changes and patterns. Examples include historical and present levels of salmon habitat use and productivity, and major factors for decline in salmon, water quality, and aquatic health in general.

Basin analyses are ideal for examining such issues as: patterns of vegetative change within basins; patterns and trends in hydropower, agricultural and urban development; basin-wide trends in water quality (e.g., temperature, dissolved oxygen, toxic contaminants, etc.); patterns and trends in water use; irrigation water withdrawals and other developments affecting the quantity or quality of water; complexity of river corridors and floodplains; and salmon passage issues.

Watershed Analysis

The concept of watershed analysis evolved out of a concern that site-by-site planning of land use activities has generally failed to adequately address the cumulative effects of complex natural and anthropogenic processes occurring throughout a watershed. Thus, an important goal of watershed analysis is to assess cumulative effects and to establish the historical (reference) condition in comparison to the watershed's current environmental baseline. Watershed analysis seeks to identify the natural and anthropogenic factors that may have influenced that baseline, as well as determine ranges in ecological conditions that are desirable or achievable within watersheds in the future. Watershed analysis helps identify existing resource problems, and allows future activities (including restoration) to be planned more effectively to attain desired conditions.

Watershed analysis helps identify specific portions of a watershed that are highly sensitive to human disturbances, such as areas prone to mass wasting or surface erosion. Finally, watershed analysis can provide information that helps to refine understanding of physical and biological processes and how these vary across the landscape. This information can be used to develop ecoregion- or basin-level standards that more accurately reflect the spatial and temporal variability in physical and ecological processes, and specifically the "capability" of watersheds and basins to support salmon.

V. Harvest Management and Hatchery Production Priorities

The NMFS recognizes the potential conflict between harvest management and hatchery production strategies designed to optimize harvest versus those strategies designed to protect and recover at-risk wild salmon stocks under the ESA. NMFS shares with many others the ultimate goal of rebuilding sustainable fisheries. The NMFS believes that this goal cannot be achieved, however, in the absence of a strong, coastwide commitment to recovering and maintaining wild salmon populations. Although the initiative behind these guidelines comes from NMFS' responsibilities under the ESA, NMFS recognizes that states intend the real scope of coastwide conservation planning to extend beyond the ESA and to encompass the region's commitment to restore the productivity of our salmon fisheries to self-sustaining levels. Therefore, this section of the guidance speaks to the relationships between hatchery production and harvest management strategies and the fundamental steps necessary to satisfy ESA requirements.

Both harvest management and hatchery production strategies should focus on the protection and recovery of at-risk wild salmon stocks. Strategies should be designed to maintain the level and distribution of spawning escapements of naturally-produced salmonids that will protect the genetic diversity and resilience of populations within each ESU. Harvest management strategies should either further reduce direct and indirect mortality to a level that will neither cause further decline nor inhibit recovery of wild populations, or if mortalities are already at or below that level, maintain that existing level until populations have recovered sufficiently to sustain higher harvest rates. Accomplishing these goals will undoubtedly require significant changes from past harvest management and hatchery production practices.

Spawning escapement objectives and stock aggregations upon which management decisions are made need to be based on the best available information on wild salmon population structures, genetics, productivity, and ocean survival. Smaller stock units may need to be defined that form the basis for management. By deliberately managing to sustain the health of smaller stock units, the larger stock aggregations will be conserved. Where a mixed-stock fishery substantially impacts more than one stock unit simultaneously, harvest rates should be geared to conserve and recover the weakest of the smaller stock units. For example, Oregon coastal natural (OCN) coho, historically, have been managed as a single stock even though the north coast streams have been chronically underescaped. Disaggregating OCN coho into smaller stock units and setting harvest rates in the mixed-stock ocean fisheries to conserve and recover the weakest OCN subunit will hasten the recovery of the entire ESU.

Allowable harvest rates in mixed-stock fisheries will need to be limited in the future to levels consistent with sustaining diverse wild salmon populations. This may mean reducing ocean harvest and changing the location and timing of harvest activities from what has historically occurred. In partial compensation, the possibility of additional harvest opportunities such as terminal or selective fishing should be explored and developed if found to be compatible with wild stock conservation. In general, harvest management strategies should be coordinated with production strategies to provide a stable and predictable base of harvest opportunity where that can be accomplished consistent with the recovery and sustainability of wild stocks.

Hatchery production strategies should avoid adverse genetic and ecological interactions between hatchery and wild salmonid stocks. A full assessment of the potential benefits and risks of utilizing current hatchery production capacity for captive brood stock programs or to "jump start" the recovery of at-risk populations through supplementation should be undertaken. Supplementation programs should be considered for implementation where deemed appropriate.

Hatchery production strategies must be closely coordinated with harvest management strategies to avoid both undesirable impacts on wild stocks and unharvestable surpluses beyond brood stock needs. Hatchery production strategies may contribute to the provision of a stable base of harvest opportunity through the development of both terminal and selective fishery opportunities.

STANDARDS

I. Harvest rates must either be reduced to (or maintained at) a level that will neither cause further decline nor inhibit the recovery of wild salmonid population structures within each ESU. These harvests might be described as "base conservation" level harvest rates. Future increases in harvest rates should be consistent with scientifically-based plans that identify target levels for spawning escapements and population diversity that are intended to result in healthy wild salmonid populations which exhibit resilience in the face of environmental variations.

II. Hatchery Production strategies should minimize, to the extent possible, adverse genetic and ecological interactions between hatchery and wild salmonid stocks.

III. Harvest management and hatchery production strategies should be coordinated to provide a predictable base of fishing opportunity for sport, commercial, and treaty Indian fisheries consistent with the conservation of wild salmon populations. Fishery managers must recognize treaty Indian fishing rights as the highest priority for providing harvest opportunity.

IV. Information strategies should be developed to more accurately monitor the status of ESUs and applicable subpopulations, and monitor freshwater/estuarine and ocean survival rates.

OBJECTIVES

I.A. Develop harvest management techniques that specifically recognize and manage for a diversity of subpopulations within each ESU (where an ESU consists of more than one subpopulation).

I.B. Avoid increasing harvest rates from base "conservation" levels until such time as ESU and appropriate subpopulation spawning escapements demonstrate significant increasing trends in natural production. Future harvest rates should be consistent with the long-term sustainability of diverse and resilient naturally-produced salmon populations.

[EXAMPLE] Harvest rates (direct and incidental) on naturally-produced coho salmon stocks from the southern Oregon/northern California and Oregon coast coho ESUs should not increase from recent year levels until spawning escapements or other stock specific performance standards have demonstrated an increasing trend. During the last three years (1994-1996) no coho retention has been allowed south of Cape Falcon, Oregon to the Mexican border and chinook salmon fisheries have been restricted, targeting an incidental harvest rate on Oregon coastal natural coho salmon of 10-12 percent. Although the Pacific Fishery Management Council's fishery management plan for managing ocean fisheries allows up to a 20 percent incidental harvest rate, no more than the recent 10-12 percent harvest rate is appropriate until an increasing trend in spawning escapements has been established.

I.B.I. Fishery managers should develop and implement fishery management plans (or other management agreements) stock performance objectives, and criteria designed to evaluate natural production trends and evaluate the impacts of corresponding harvest controls on naturally-produced salmonid populations. Examples of potential performance criteria might include spawning escapement trend analysis, return per spawner analysis, and various types of survival criteria.

II.A. Manage hatchery programs to protect and promote natural population diversity and not be a factor in homogenization of populations.

II.B. Use only local subpopulation broodstock for hatchery programs operated for supplementation. Hatchery programs operated for harvest may use non-indigenous broodstock only if it can be shown that gene flow from non-native to native fish (straying) is either negligible or is at a biologically acceptable level. It is important that efforts be made to evaluate the reproductive success of naturally spawning hatchery fish and biologically acceptable standards be developed. In some cases, NMFS has utilized an interim straying guideline of <5 percent of the naturally spawning populations, but it has not been established that the rate of gene flow at a 5 percent stray rate is biologically acceptable.

II.C. Prioritize utilization of hatchery production capacity as follows: 1) captive brood and/or supplementation of ESA-listed populations where necessary; 2) supplementation, where appropriate, of other at-risk natural populations; and 3) production to support sport, commercial, and tribal fisheries that is consistent with the recovery and maintenance of wild salmonid populations.

II.D. Undertake hatchery production to support sustainable fisheries in a manner that minimizes adverse interactions with wild salmon (e.g. interbreeding, competition, predation, disease transmission, overharvest).

II.D.1 - Competition with hatchery-reared smolts should not result in a reduction in size or growth rate of naturally produced smolts at ocean entry.

II.D.2 - Locate and time releases of hatchery fish to minimize potential for interactions with naturally produced fish.

[EXAMPLE] Hatchery steelhead released into areas co-habited by chinook salmon should be released at sizes that increase their migratory tendency (i.e., reduce residualization) and reduce predation on chinook salmon. Residualization and predation pose ecological risks to juvenile chinook salmon that appear to be reduced by contrasting strategies of steelhead release size. While it is unclear precisely what range of sizes will simultaneously reduce both risks, available evidence indicates that hatchery steelhead released at sizes (1) smaller than about 170 mm show greater tendency to residualize in freshwater rearing areas and interact ecologically with juvenile chinook salmon and (2) larger than about 200 mm have a higher propensity to prey on underyearling chinook salmon. In the absence of more definitive evidence for the relative magnitudes of these threats, it is preferable to try to minimize both. Releasing hatchery steelhead at average sizes within this range (170 to 220 mm) may be an effective interim strategy to reduce both risks.

II.D.3 - Integrate hatchery production strategies for sustainable fisheries with harvest management strategies to ensure that the number of adults returning to the hatchery does not substantially exceed brood stock needs. Hatchery production may need to be decreased (or even eliminated in some areas) to avoid unharvestable surpluses based on inaccessibility to harvest. Returning hatchery adults in excess of egg take needs should not be allowed to stray into natural spawning areas where they may adversely impact naturally-spawning populations (see II.B.).

II.E. Adopt and manage artificial production programs to the policies and audit procedures of the Integrated Hatchery Operations Team (IHOT). These policies address coordination, hatchery performance, fish health, ecological interactions, and genetics. Independent performance audits should be performed every 3 to 5 years to ensure hatcheries are conforming to established policies and procedures.

III.A. Develop harvest management and hatchery production strategies that allow utilization of surplus production for sport, commercial and tribal fisheries in locations and in a manner that minimizes impacts on at-risk naturally-produced salmon populations.

III.A.1. - Efforts should be made to identify and exploit localized terminal area rearing and fishing opportunities that do not interfere with recovery of at-risk wild salmon stocks.

III.A.2. - Selective fisheries for hatchery produced salmon which have been mass marked may have the potential to contribute to a predictable base of fishing opportunity. However, it has not yet been demonstrated through sound scientific analyses that the impacts of such a strategy would not adversely affect the recovery of naturally-produced salmonid stocks. The cooperation and agreement of all affected fisheries management authorities is necessary to ensure the appropriate analysis and monitoring.

III.B. Give first priority in harvest management regimes to meeting treaty Indian fishing obligations.

IV.A Establish comprehensive escapement monitoring programs to allow review of ESU and subpopulation trends.

IV.B. Establish research and monitoring programs to determine survival levels and trends and other indices of population health/viability.

IV.B.1 - Monitor representative basins for biological indices at ocean entry: CPE, size, growth rate.

IV.B.2 - Measure freshwater/estuarine and ocean survival of representative naturally-produced populations.

IV.B.3 - Measure survival of representative hatchery populations.

IV.B.4 - Determine the proportion of hatchery fish on the spawning grounds and evaluate the reproductive success of naturally spawning hatchery fish.

APPENDIX I

Key Basins for Coho Salmon in Oregon

Proposal

This appendix identifies several key basins along the Oregon coast which should be the focus of coordinated coho salmon assessment, protection, and restoration efforts. The suggestions and guidance given here are NMFS' first attempt to establish priorities for efforts to conserve coho salmon, and are intended to serve as one example of prioritization.

Rationale

Currently, state and Federal agencies, tribes and others are identifying actions (measures) that are likely to benefit coho salmon in Oregon. While many measures will be applicable across the coastal landscape (e.g., improved enforcement of existing regulations), others may be clustered in particular basins, watersheds, rivers, or reaches. Clustering conservation measures in "key" basins or smaller geographic units will avoid a spatially or functionally fragmented approach which is unlikely to be effective at maintaining and restoring ecosystem functions. Focussing efforts in high priority areas is consistent with an emerging consensus from resource managers and conservation experts who believe it is critical to save the "best" habitat and to establish priorities for restoration of other habitat. Furthermore, focussing on high priorities is likely to give the greatest return in productivity for effort and expense.

The ODFW is presently mapping "core" areas for coho and other species. These core areas represent specific river reaches within each river basin on the Oregon coast where concentrations of spawning or rearing salmon occur or are expected to occur. Core area maps will assist coho recovery by focussing project efforts in key river reaches throughout the Oregon coast which provide the best remaining coho habitats. This is important because funds and technical staff are insufficient to address all problems in all river basins, watersheds, and rivers. Finally, establishing geographic priorities provides a basis for focussing the efforts of all stakeholders.

From a biological perspective, river basins typically define and separate individual salmon populations (e.g., Cummins Creek coho salmon). As a first step toward ESU recovery, it is imperative that we begin to learn how to promote population recovery by linking the core areas and their supporting watersheds together at the basin level.

Biogeographic Setting

The ODFW has identified approximately 91 populations (in 59 river basins) of coho salmon from the mouth of the Columbia River to the California border (Table 1). These populations are distributed among 19 USGS hydrologic units (HUCs) and have been provisionally assigned to four ODFW Gene Conservation Groups (GCGs) and two Evolutionarily Significant Units (ESUs) (Figure 1). Populations south of Cape Blanco are included in a southern Oregon/northern California ESU (which includes populations in coastal rivers between Cape Blanco and Punta Gorda, California).

Setting Priorities Among Basins

Key basins for coho salmon were identified using the following criteria and data sources:

I. Key basins should be representative of the species' diversity (in terms of both genetics and life history) and dispersed along the coast so that they are adjacent to other, less productive basins. This would provide some degree of protection from extinction for salmon in less productive basins through natural straying from salmon in more productive basins. The NMFS suggests identifying a minimum of four basins (i.e., one for each GCG).

Data Sources:
* NMFS ESU boundaries
* ODFW GCG boundaries

II. Key basins should have large numbers of natural spawners, miles of habitat, and "core" areas, relative to other basins.

Data Sources:
* ODFW 1990-1996 coho spawner escapement data
* ODFW Core Area maps (under development)
* Handbook for Identifying Native Salmon and Watershed Protection and Restoration (i.e., Bradbury Handbook) - north coast only.
* AFS Aquatic Diversity Areas (from Bradbury Handbook)

Results

The two basins in each GCG which have recently produced the highest numbers of spawners are presented below and in Figure 2.

<u>North/Mid Coast GCG:</u>

<u>(1) Siuslaw River Basin (comprising two populations).</u> The Siuslaw River Basin ranks fourth overall in spawner

abundance (4,000 fish) and third in spawning habitat (515 miles) among the Oregon coast basins.

(2) Nehalem Bay River Basin (comprising 2-3 populations). The Nehalem River Basin ranks eighth overall in spawner abundance (2,200 fish) and fourth in spawning habitat (385 miles) among the Oregon coast basins.

Umpqua GCG:

(1) Umpqua River Basin (comprising 4 populations). While it is the only basin in the GCG, the Umpqua River Basin ranks second overall in recent spawner abundance (5,670 fish) and first in spawning habitat (1,177 miles) among the Oregon coast basins.

Mid/South Coast GCG:

(1) Coos Bay Basin (comprising 7 populations). The Coos River Basin has produced the most spawners (10,380 fish) of all Oregon coast basins. It ranks eighth in spawning habitat (210 miles).

(2) Coquille Bay River Basin (comprising 2 populations). The Coquille River Basin ranks third overall in spawner abundance (4,200 fish) and fourth in spawning habitat (336 miles) among the Oregon coast basins.

South Coast GCG:

(1) Rogue River Basin (comprising 3-5 populations). The Rogue River Basin ranks sixth overall in spawner abundance (2,500 fish) and second in spawning habitat (518 miles) among the Oregon coast basins.

Together, these six basins account for approximately 64% of the total spawner escapements from 1990-1995, and 68% of the remaining spawning habitat along the Oregon coast.

It is clear that certain populations and basins are currently more productive than others and hence should receive immediate protection. A conservation strategy should (1) assess why these areas are better, (2) implement whatever measures are necessary to protect the productive characteristics and "core" river reaches in each basin, and, (3) determine how best to expand healthy characteristics in these and other basins.

While this list does not include small basins, it is important to recognize that these systems are undoubtedly important components of the coastal coho gene pool. Hopefully, coastwide conservation measures and actions of watershed councils outside the basins identified above will maintain the productivity of these small basins.

APPENDIX II

Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale

Prepared by
The National Marine Fisheries Service
Environmental and Technical Services Division
Habitat Conservation Branch

August 1996

Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale

Table of Contents

Footnote:

1) The species narrative is intended to provide the biologist or evaluator with an up-to-date source of information on the general biological parameters associated with the particular species being evaluated. References for additional information sources are provided.

OVERVIEW

The following guidelines are designed to facilitate and standardize determinations of effect for Endangered Species Act (ESA) conferencing, consultations and permits focusing on anadromous salmonids. We recommend that this process be applied to individual or grouped actions at the watershed scale. When the National Marine Fisheries Service (NMFS) conducts an analysis of a proposed activity it involves the following steps: (1) Define the biological requirements of the listed species; (2) evaluate the relevance of the environmental baseline to the species' current status; (3) determine the effects of the proposed or continuing action on listed species; and (4) determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the environmental baseline and any cumulative effects, and considering measures for survival and recovery specific to other life stages. The last item (item 4) addresses considerations given during a jeopardy analysis.

This document provides a consistent, logical line of reasoning to determine when and where adverse effects occur and why they occur. Please recognize that this document does not address jeopardy or identify the level of take or adverse effects which would constitute jeopardy. Jeopardy is determined on a case by case basis involving the specific information on habitat conditions and the health and status of the fish population. NMFS is currently preparing a set of guidelines, to be used in conjunction with this document, to help in the determination of jeopardy.

This document contains definitions of ESA effects and examples of effects determinations, a matrix of pathways of effects and indicators of those effects, a checklist for documenting the environmental baseline and effects of the proposed action(s) on the relevant indicators, and a dichotomous key for making determinations of effect. None of the tools identified in this document are new inventions. The matrix, checklist, and dichotomous key format were developed by the US Fish and Wildlife Service (USFWS) Region 2 and the USDA Forest Service Region 3 for a programmatic ESA section 7 consultation on effects of grazing (USFWS, May 5, 1995). The matrix developed here reflects the information needed to implement the Aquatic Conservation Strategy (ACS)(appendix D) and to evaluate effects relative to the Northwest Forest Plan ACS Objectives, and the Ecological Goals in the Proposed Recovery Plan for Snake River Salmon (appendix D) and the LRMP consultation on the eight National Forests in Idaho and Oregon.

Using these tools, the Federal agencies and Non-Federal Parties (referred to as evaluators in the remainder of this document) can make determinations of effect for proposed projects (i.e. "no effect"/"may affect" and "may affect, not likely to adversely affect"/"may affect, likely to adversely affect"). As explained below, these determinations of effect will depend on whether a proposed action (or group of actions) hinders the attainment of relevant environmental conditions (identified in the matrix as pathways and indicators) and/or results in "take", as defined in ESA, section 3 (18) of a proposed or listed species.

Finally, this document was designed to be applied to a wide range of environmental conditions. This means it must be flexible. It also means that a certain degree of professional judgement will be required in its application. **There will be circumstances where the ranges of numerics or descriptions in the matrix simply do not apply to a specific watershed or basin. In such a case, the evaluator will need to provide more biologically appropriate values. When this occurs, documentation justifying these changes should be presented in the biological assessment, habitat conservation plan, or other appropriate document so that NMFS can use it in preparation of a section 7 consultation, habitat conservation plan, or other appropriate biologically based document.**

Description of the Matrix:

The "Matrix of Pathways and Indicators" (Table 1) is designed to summarize important environmental parameters and levels of condition for each. This matrix is divided into six overall pathways (major rows in the matrix):

-- Water Quality -- Channel Condition and Dynamics
-- Habitat Access -- Flow/Hydrology
-- Habitat Elements -- Watershed Conditions

Each of the above represents a significant pathway by which actions can have potential effects on anadromous salmonids and their habitats. The pathways are further broken down into "indicators." Indicators are generally of two types: (1) Metrics that have associated numeric values (e.g. "six pools per mile"); and (2) descriptions (e.g. "adequate habitat refugia do not exist"). The purpose of having both types of indicators in the matrix is that numeric data are not always readily available for making determinations (or there are no reliable numeric indicators of the factor under consideration). In this case, a description of overall condition may be the only appropriate method available.

The columns in the matrix correspond to levels of condition of the indicator. There are three condition levels: "properly functioning," "at risk," and "not properly functioning." For each indicator, there is either a numeric value or range for a metric that describes the condition, a description of the condition, or both. When a numeric value and a description are combined in the same cell in the matrix, it is because accurate assessment of the indicator requires attention to both.

Description of the Checklist:

The "Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators" (Table 2) is designed to be used in conjunction with the matrix. The checklist has six columns. The first three describe the condition of each indicator (which when taken together encompass the environmental baseline), and the second three describe the effects of the proposed action(s) on each indicator.

Description of the Dichotomous Key for Making ESA Determinations of Effect:

The "Dichotomous Key for Making ESA Determinations of Effect" (p. 15) is designed to guide determinations of effect for proposed actions that require a section 7 consultation or permit under Section 10 of the ESA. Once the matrix has been tailored (if necessary) to meet the needs of the evaluators, and the checklist has been filled out, the evaluators should use the key to help make their ESA determinations of effect.

How to Use the Matrix, Checklist, and Dichotomous Key

1) Group projects that are within a watershed.

2) Using the Matrix provided (or a version modified by the evaluator) **evaluate environmental baseline conditions** (mark on checklist), use all 6 pathways (identified in the matrix).

Matrix of Pathways and Indicators

Use to describe the Environmental Baseline Conditions

Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow/Hydrology, Watershed Condition

and

Then use the same Pathways and Indicators to evaluate the Proposed Projects

3) **Evaluate effects of the proposed action** using the matrix. Do they restore, maintain or degrade existing baseline conditions? Mark on checklist.

↓

Mark Results on Checklist

↓

Checklist

Environmental Baseline			Effects of the Action		
Properly Funct.	At Risk	Not Properly Funct.	Maintain	Restore	Degrade

4) Take the checklist you marked and the dichotomous key and answer the questions in the key **to reach a determination of effects.**

↓

Use Professional Judgement and the Checklist to Work through the Dichotomous Key

↓

Dichotomous Key

Yes/No

No Effect
May Effect
Not Likely to Adversely Affect
Likely to Adversely Affect

(Note: Actual Matrix is on page 9,10,& 11. Actual Checklist on page 13. Actual Dichotomous key on page 14)

DEFINITIONS OF ESA EFFECTS AND EXAMPLES

Definitions of Effects Thresholds

Following are definitions of ESA effects (sources in *italics*). The first three ("no effect," "may affect, not likely to adversely affect," and "may affect, likely to adversely affect") are not defined in the ESA or implementing regulations. However, "likely to jeopardize" is defined in the implementing regulations:

"No effect:"

This determination is only appropriate "if the proposed action will literally have no effect whatsoever on the species and/or critical habitat, not a small effect or an effect that is unlikely to occur." (From "*Common flaws in developing an effects determination*", Olympia Field Office, U.S. Fish and Wildlife Service). Furthermore, actions that result in a "beneficial effect" do not qualify as a no effect determination.

"May affect, not likely to adversely affect:"

"The appropriate conclusion when effects on the species or critical habitat are expected to be beneficial, discountable, or insignificant. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgement, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur." (From "*Draft Endangered Species Consultation Handbook; Procedures for Conducting Section 7 Consultations and Conferences*," USFWS/NMFS, 1994). The term "negligible" has been used in many ESA consultations involving anadromous fish in the Snake River basin. The definition of this term is the same as "insignificant."

"May affect, likely to adversely affect"

The appropriate conclusion when there is "more than a negligible potential to have adverse effects on the species or critical habitat" (*NMFS draft internal guidelines*). Unfortunately, there is no definition of adverse effects in the ESA or its implementing regulations. The draft Endangered Species Handbook (NMFS/USFWS, June 1994) provides this definition for "Is likely to adversely affect": "This conclusion is reached if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions. In the event the overall effect of the proposed action is beneficial to the listed species or critical habitat, but may also cause some adverse effects to individuals of the listed species or segments of the critical habitat, then the proposed action 'is likely to adversely affect' the listed species or critical habitat."

The following is a definition specific to anadromous salmonids developed by NMFS, the FS, and the BLM during the PACFISH consultation; "Adverse effects include short or long-term, direct or indirect management-related, impacts of an individual or cumulative nature such as mortality, reduced growth or other adverse physiological changes, harassment of fish, physical disturbance of redds, reduced reproductive success, delayed or premature migration, or other adverse behavioral changes to listed anadromous salmonids at any life stage. Adverse effects to designated critical habitat include effects to any of the essential features of critical habitat that would diminish the value of the habitat for the survival and recovery of listed anadromous salmonids" (From *NMFS' Pacfish Biological Opinion, 1/23/95*). Interpretation of part of the preceding quotation has been problematic. The statement "...impacts of an individual or cumulative nature..." has often been applied only to actions and impacts, not organisms. NMFS' concern with this definition is that it does not clearly state that the described impacts include those to individual eggs or fish. However, this definition is useful if it is applied on the individual level as well as on the subpopulation and population levels.

For the purposes of Section 7, any action which has more than a negligible potential to result in "take" (see definition at bottom of Dichotomous Key, p. 14 of this document) is likely to adversely affect a proposed/listed species. It is not possible for NMFS or USFWS to concur on a "not likely to adversely affect" determination if the proposed action will cause take of the listed species. Take can be authorized in the Incidental Take Statement of a Biological Opinion after the anticipated extent and amount of take has been described, and the effects of the take are analyzed with respect to jeopardizing the species or adversely modifying critical habitat. <u>Take, as defined in the ESA, clearly applies to the individual level, thus actions that have more than a negligible potential to cause take of individual eggs and/or fish are "likely to adversely affect."</u>

"Likely to jeopardize the continued existence of"

The regulations define jeopardy as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (*50 CFR §402.02*).

"**Take**"

The ESA (Section 3) defines take as "to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect or attempt to engage in any such conduct". The USFWS further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering", and "harass" as "actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering".

Examples of Effects Determinations

"No effect"

NMFS is encouraging evaluators to conference/consult at the watershed scale (i.e., on all proposed actions in a particular watershed) rather than on individual projects. Due to the strict definition of "no effect" (above), the interrelated nature of in-stream conditions and watershed conditions, and the watershed scale of these conferences, consultations, and activities "no effect" determinations for all actions in a watershed could be rare when proposed/listed species are present in or downstream from a given watershed. This is reflected in the dichotomous key, however the evaluator may identify some legitimate exceptions to this general rule.

Example:

The proposed project is in a watershed where available monitoring information indicates that in-stream habitat is in good functioning condition and riparian vegetation is at or near potential. The proposed activity will take place on stable soils and will not result in increased sediment production. No activity will take place in the riparian zone.

"May affect, not likely to adversely affect"

Example:

The proposed action is in a watershed where available monitoring information indicates that in-stream habitat is in good functioning condition and riparian vegetation is at or near potential. Past monitoring indicates that this type of action has led to the present condition (i.e., timely recovery has been achieved with the kind of management proposed in the action). Given available information, the potential for take to occur is negligible.

"May affect, likely to adversely affect"

Example:

The proposed action is in a watershed that has degraded baseline conditions such as excess fine sediment, high cobble embeddedness, or poor pool frequency/quality. If the action will further degrade any of these pathways, the determination is clearly "likely to adversely affect".

A less obvious example would be a proposed action in the same watershed that is designed to improve baseline conditions, such as road obliteration or culvert repair. Even though the intent is to improve the degraded conditions over the long-term, if any short-term impacts (such as temporary turbidity and sedimentation) will cause take (adverse effects), then the determination is "likely to adversely affect."

TABLE 1. MATRIX of PATHWAYS AND INDICATORS

(Remember, the <u>ranges</u> of criteria presented here are not absolute, they may be adjusted for unique watersheds. See p. 3)

PATHWAY	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Water Quality:	Temperature	50-57° F[1]	57-60° (spawning) 57-64° (migration &rearing)[2]	> 60° (spawning) > 64° (migration & rearing)[2]
	Sediment/Turbidity	< 12% fines (<0.85mm) in gravel[3], turbidity low	12-17% (west-side)[3], 12-20% (east-side)[2], turbidity moderate	>17% (west-side)[3], >20% (east side)[2] fines at surface or depth in spawning habitat[2], turbidity high
	Chemical Contamination/ Nutrients	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches[5]	moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach[5]	high levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach[5]
Habitat Access:	Physical Barriers	any man-made barriers present in watershed allow upstream and downstream fish passage at all flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows
Habitat Elements:	Substrate	dominant substrate is gravel or cobble (interstitial spaces clear), or embeddedness <20%[3]	gravel and cobble is subdominant, or if dominant, embeddedness 20-30%[3]	bedrock, sand, silt or small gravel dominant, or if gravel and cobble dominant, embeddedness >30%[2]
	Large Woody Debris	<u>Coast:</u> >80 pieces/mile >24"diameter >50 ft. length[4]; <u>East-side:</u> >20 pieces/ mile >12"diameter >35 ft. length[2]; and adequate sources of woody debris recruitment in riparian areas	currently meets standards for properly functioning, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard	does not meet standards for properly functioning and lacks potential large woody debris recruitment

	Pool Frequency channel width # pools/mile[6] 5 feet 184 10 " 96 15 " 70 20 " 56 25 " 47 50 " 26 75 " 23 100 " 18	meets pool frequency standards (left) and large woody debris recruitment standards for properly functioning habitat (above)	meets pool frequency standards but large woody debris recruitment inadequate to maintain pools over time	does not meet pool frequency standards
	Pool Quality	pools >1 meter deep (holding pools) with good cover and cool water[3], minor reduction of pool volume by fine sediment	few deeper pools (>1 meter) present or inadequate cover/temperature[3], moderate reduction of pool volume by fine sediment	no deep pools (>1 meter) and inadequate cover/temperature[3], major reduction of pool volume by fine sediment
	Off-channel Habitat	backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.)[3]	some backwaters and high energy side channels[3]	few or no backwaters, no off-channel ponds[3]
	Refugia (important remnant habitat for sensitive aquatic species)	habitat refugia exist and are adequately buffered (e.g., by intact riparian reserves); existing refugia are sufficient in size, number and connectivity to maintain viable populations or sub-populations[7]	habitat refugia exist but are not adequately buffered (e.g., by intact riparian reserves); existing refugia are insufficient in size, number and connectivity to maintain viable populations or sub-populations[7]	adequate habitat refugia do not exist[7]
Channel Condition & Dynamics:	Width/Depth Ratio	<10[2,4]	10-12 (we are unaware of any criteria to reference)	>12 (we are unaware of any criteria to reference)
	Streambank Condition	>90% stable; i.e., on average, less than 10% of banks are actively eroding[2]	80-90% stable	<80% stable
	Floodplain Connectivity	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly

Flow/Hydrology:	Change in Peak/ Base Flows	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	zero or minimum increases in drainage network density due to roads[8,9]	moderate increases in drainage network density due to roads (e.g., ≈5%)[8,9]	significant increases in drainage network density due to roads (e.g., ≈20-25%)[8,9]
Watershed Conditions:	Road Density & Location	<2 mi/mi²[11], no valley bottom roads	2-3 mi/mi², some valley bottom roads	>3 mi/mi², many valley bottom roads
	Disturbance History	<15% ECA (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area (except AMAs), ≥15% retention of LSOG in watershed[10]	<15% ECA (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area (except AMAs), ≥15% retention of LSOG in watershed[10]	>15% ECA (entire watershed) and disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG retention
	Riparian Reserves	the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact),and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/ composition >50%[12]	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system, or incomplete protection of habitats and refugia for sensitive aquatic species (≈70-80% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better[12]	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats and refugia for sensitive aquatic species (<70% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition <25%[12]

[1] Bjornn, T.C. and D.W. Reiser, 1991. Habitat Requirements of Salmonids in Streams. American Fisheries Society Special Publication 19:83-138. Meehan, W.R., ed.
[2] Biological Opinion on Land and Resource Management Plans for the: Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests. March 1, 1995.
[3] Washington Timber/Fish Wildlife Cooperative Monitoring Evaluation and Research Committee, 1993. Watershed Analysis Manual (Version 2.0). Washington Department of Natural Resources.
[4] Biological Opinion on Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). National Marine Fisheries Service, Northwest Region, January 23, 1995.
[5] A Federal Agency Guide for Pilot Watershed Analysis (Version 1.2), 1994.
[6] USDA Forest Service, 1994. Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin.

[7] Frissell, C.A., Liss, W.J., and David Bayles, 1993. An Integrated Biophysical Strategy for Ecological Restoration of Large Watersheds. Proceedings from the Symposium on Changing Roles in Water Resources Management and Policy, June 27-30, 1993 (American Water Resources Association), p. 449-456.

[8] Wemple, B.C., 1994. Hydrologic Integration of Forest Roads with Stream Networks in Two Basins, Western Cascades, Oregon. M.S. Thesis, Geosciences Department, Oregon State University.

[9] e.g., see Elk River Watershed Analysis Report, 1995. Siskiyou National Forest, Oregon.

[10] Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.

[11] USDA Forest Service, 1993. Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities.

[12] Winward, A.H., 1989 Ecological Status of Vegatation as a base for Multiple Product Management. Abstaracts 42nd annual meeting, Society for Range Management, Billings MT, Denver CO: Society For Range Managem nt: p277.

TABLE 2. CHECKLIST FOR DOCUMENTING ENVIRONMENTAL BASELINE AND EFFECTS OF PROPOSED ACTION(S) ON RELEVANT INDICATORS

PATHWAYS: INDICATORS	ENVIRONMENTAL BASELINE			EFFECTS OF THE ACTION(S)		
	Properly Functioning[1]	At Risk[1]	Not Propr. Functioning[1]	Restore[2]	. . Maintain[3]	Degrade[4]
Water Quality: Temperature						
Sediment						
Chem. Contam./Nut.						
Habitat Access: Physical Barriers						
Habitat Elements: Substrate						
Large Woody Debris						
Pool Frequency						
Pool Quality						
Off-channel Habitat						
Refugia						
Channel Cond. & Dyn: Width/Depth Ratio						
Streambank Cond.						
Floodplain Connectivity						
Flow/Hydrology: Peak/Base Flows						
Drainage Network Increase						
Watershed Conditions: Road Dens. & Loc.						
Disturbance History						
Riparian Reserves						

Watershed Name:____ Location:____________________________

1 These three categories of function ("properly functioning", "at risk", and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators" (Table 1 on p. 10).

2 For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning", or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

3 For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).

4 For the purposes of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

FIGURE 1. DICHOTOMOUS KEY FOR MAKING ESA DETERMINATION OF EFFECTS

1. Are there any proposed/listed anadromous salmonids and/or proposed/designated critical habitat in the watershed or downstream from the watershed?

   NO . . . . No effect

   YES . . . . May affect, go to 2

2. Does the proposed action(s) have the potential to hinder attainment of relevant properly functioning indicators (from table 2)?

   YES . . . . Likely to adversely affect

   NO . . . . Go to 3

3. Does the proposed action(s) have the potential to result in "take"[1] of proposed/listed anadromous salmonids or destruction/adverse modification of proposed/designated critical habitat?

   A. There is a negligible (extremely low) probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of habitat . . . . Not likely to adversely affect

   B. There is more than a negligible probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of habitat. . . . . Likely to adversely affect

[1] "Take" - The ESA (Section 3) defines take as "to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect or attempt to engage in any such conduct". The USFWS (USFWS, 1994) further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering", and "harass" as "actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering".

Appendix A
Overview of Some Key Habitat Elements and Activities Affecting Them

The following are excerpts from A Coarse Screening Process For Potential Application in ESA Consultations (CRITFC, 1994). The excerpts are intended to stimulate the biologist's thought processes into evaluating all of the pathways through which habitat degradation could occur. Unfortunately this is not an all inclusive list. However, it is a start. We recommend that biologists review the entire "Coarse Screening" document and any other documents that are available to them. The "Coarse screening" document is available from The National Marine Fisheries Service, Portland, Oregon. We also highly recommend reviewing a report prepaired by ManTech Environmental Research Services Corporation while under contract to the National Marine Fishereis Service (NMFS), Environmental Protection Agency and US Fish and Wildlife Service. The document is entitled "An Ecosystem Approach to Salmonid Conservation". This document is also available from the NMFS in Portland, Oregon.

Channel Substrate:
"Salmon survival and production are reduced as fine sediment increases, producing multiple negative impacts on salmon at several life stages. Increased fine sediment entombs incubating salmon in redds, reduces egg survival by reducing oxygen flow,
alters the food web, reduces pool volumes for adult and juvenile salmon, and reduces the availability of rearing space for juveniles rendering them more susceptible to predation. Reduced survival-to-emergence (STE) for salmon caused by elevated fine sediment increases is of particular concern because it is a source of density-independent mortality that can have extremely significant negative effects on salmon populations even at low seeding.

The rearing capacity of salmon habitat is decreased as cobble embeddedness levels increase. Overwinter rearing habitat may be a major limiting factor to salmon production and survival. The loss of overwintering habitat may result in increased levels of mortality during rearing life stages."

Channel Morphology
"Available data indicate that the production of salmon is reduced as pool frequency and volume decrease. Large pools are required by salmon during rearing, spawning, and migration. Pools provide thermal refugia, velocity refugia during storm events, resting habitat for migrating salmon, and important rearing habitat for juvenile salmon."

"Fine sediment is deposited in pools during waning flows. Residual pool volume is the volume of a pool not filled by fine sediment accumulations. Fine sediment volumes in pools reduce pool quality and reduce residual pool volumes (the pool volume available for salmon use)."

"Available data indicate that salmon production increases as Large Woody Debris (LWD) increases. LWD provides cover, velocity refugia, and plays a vital role in pool formation and the maintenance of channel complexity required by salmon in natal habitat. LWD also aids in reducing channel erosion and buffering sediment inputs by providing sediment storage in headwater streams."

Bank Stability
"Bank stability is of prime importance in maintaining habitat conditions favoring salmon survival. Bank instability increases channel erosion that can lead to increased levels of fine sediment and the in-filling of pools. Unstable banks can lead to stream incisement that can reduce baseflow contributions from groundwater and increase water temperature. Bank instability can cause channel widening that can significantly exacerbate seasonal water temperature extremes and destabilize LWD."

Water Temperature
"Available information indicates that the elevation of summer water temperatures impairs salmon production at scales ranging from the reach to the stream network and puts fish at greater risk through a variety of effects that operate at scales ranging from the individual organism to the aquatic community level. Maximum summer water temperatures in excess of 60^{o}F impair salmon production. However, many smaller streams naturally have much lower temperatures and these conditions are critical to maintaining downstream water temperatures. At the stream system level, elevated water temperatures reduce the area of usable habitat during the summer and can render the most potentially productive and structurally complex habitats unusable. Decreases in winter water temperatures also put salmon at additional risk. The loss of vegetative shading is the predominant cause of anthropogenically elevated summer water temperature. Channel widening and reduced baseflows exacerbate seasonal water temperature extremes. Elevated summer water temperatures also reduce the diversity of coldwater fish assemblages."

Water Quantity and Timing
"The frequency and magnitude of stream discharge strongly influence substrate and channel morphology conditions, as well as the amount of available spawning and rearing area for salmon. Increased peak flows can cause redd scouring, channel widening, stream incisement, increased sedimentation. Lower streamflows are more susceptible to seasonal temperature extremes in both winter and summer. The dewatering of reaches can block salmon passage."

<u>Some Major Activities and their Effects</u>

Logging
Regional differences in climate, geomorphology, soils, and vegetation may greatly influence timber harvest effects on streams of a given size. However, some broad generalizations can be made on how timber harvest affects the hydrologic cycle, sediment input, and channel morphology of streams:

1. Hydrologic cycle. Timber harvest often alters normal streamflow patterns, particularly the volume of peak flows (maximum volume of water in the stream) and base flows (the volume of water in the stream representing the groundwater contribution). The degree these parameters change depend on the percentage of total tree cover removed from the watershed and the amount of soil disturbance caused by the harvest, among other things. For example, if harvest activities remove a high percentage of tree cover and cause light soil disturbance and compaction, rain falling on the soil will infiltrate normally. However, due to the loss of tree cover, evapotranspiration (the loss of water by plants to the atmosphere) will be much lower than before. Thus, the combination of normal water infiltration into the soil and greatly decreased uptake and loss of water by the tree cover results in substantially higher, sustained streamflows. Hence, this type of harvest results in higher base flows during dry times of the year when evapotranspiration is high, but does not greatly affect peak flows during wet times of the year because infiltration has not decreased and evapotranspiration is low. On the other hand, if the harvest activities cause high soil disturbance and compaction, little rainfall will be able to penetrate the soil and recharge groundwater. This results in higher surface runoff and equal or slightly higher base flows during dry times of the year. During wet times of the year, the compacted soils deliver high amounts of surface runoff, substantially increasing peak flows. In general, timber harvest on a watershed-wide scale results in water moving more quickly through the watershed (i.e., higher runoff rates, higher peak and base flows) because of decreased soil infiltration and evapotranspiration. This greatly simplified model only partly illustrates the complex hydrologic responses to timber harvest (Chamberlain et al. 1991, Gordon et al. 1992).

2. Sediment input. Timber harvest activities such as road-building and use, skidding logs, clear-cutting, and burning increase the amount of bare compacted soil exposed to rainfall and runoff, resulting in higher rates of surface erosion. Some of this hillside sediment reaches streams via roads, skid trails, and/or ditches (Chamberlain et al. 1991). Appropriate management precautions such as avoiding timber harvest in very wet seasons, maintaining buffer zones below open slopes, and skidding over snow can decrease the amount of surface erosion (Packer 1967). Harvest activities can also greatly increase the likelihood of mass soil movements occurring, particularly along roads and on clear-cuts in steep terrain (Furniss et al. 1991, O'Loughlin 1972). Increased surface erosion and mass soil movements associated with timber harvest areas can result in an increase in sediment input to streams. Fine sediment may infiltrate into relatively clean streambed gravels or, if the supply of fine sediment is large, settle deeper into the streambed (Chamberlain et al. 1991).

3. Stream channel morphology. The hydrologic and sedimentation changes discussed above can influence a stream's morphology in many ways. Substantial increases in the volume and frequency of peak flows can cause streambed scour and bank erosion. A large sediment supply may cause aggradation of the stream channel, pool filling, and a reduction in gravel quality (Madej 1982). Streambank destabilization from vegetation removal, physical breakdown, or channel aggradation adds to sediment supply and generally results in a loss of stream channel complexity (Scrivener 1988). In addition, losses of in-stream large woody debris supplies (i.e., removal of riparian trees) also result in less channel complexity as wood-associated scour pools decrease in size and disappear (Chamberlain et al. 1991).

Roads
"Roads are one of the greatest sources of habitat degradation. Roads significantly elevate on-site erosion and sediment delivery, disrupt subsurface flows essential to the maintenance of baseflows, and can contribute to increased peak flows. Roads within riparian zones reduce shading and disrupt LWD sources for the life of the road. These effects degrade habitat by increasing fine sediment levels, reducing pool volumes, increasing channel width and exacerbating seasonal temperature extremes."

Grazing
The impacts of livestock grazing to stream habitat and fish populations can be separated into

acute and chronic effects. Acute effects are those which contribute to the immediate loss of individual fish, and loss of specific habitat features (undercut banks, spawning beds, etc.) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, etc.). Chronic effects are those which, over a period of time, result in loss or reductions of entire populations of fish, or widespread reductions in habitat quantity and/or quality.

Acute Effects
Acute effects to habitat include compacting stream substrates, collapse of undercut banks, destabilized streambanks and localized reduction or removal of herbaceous and woody vegetation along streambanks and within riparian areas (Platts 1991). Increased levels of sediment can result through the resuspension of material within existing stream channels as well as increased contributions of sediment from adjacent streambanks and riparian areas. Impacts to stream and riparian areas resulting from grazing are dependent on the intensity, duration, and timing of grazing activities (Platts 1989) as well as the capacity of a given watershed to assimilate imposed activities, and the pre-activity condition of the watershed (Odum 1981).

Chronic Effects
Chronic effects of grazing result when upland and riparian areas are exposed to activity and disturbance levels that exceed assimilative abilities of a given watershed. Both direct and indirect fish mortality are possible, and the potential for mortality extends to all life cycle phases. As an example, following decades of high intensity season-long grazing on BLM lands in the Trout Creek Mountains of southeast Oregon, the Whitehorse Creek watershed had extensive areas of degraded upland and riparian habitat (BLM 1992). An extreme rain-on-snow event in late winter 1984 and subsequent flooding of area streams flushed adult and juvenile trout through area streams and into Whitehorse Ranch fields and the adjacent desert.

Although less extreme, increases in stream temperature and reduced allochthonous inputs following removal of riparian vegetation, increased sedimentation, and decreased water storage capacity work together to reduce the health and vigor of stream biotic communities (Armour et al. 1991, Platts 1991, Chaney et al. 1990). Increased sediment loads reduce primary production in streams. Reduced instream plant growth and riparian vegetation limits populations of terrestrial and aquatic insects. Persistent degraded conditions adversely influence resident fish populations (Meehan 1991).

Mining
"Mining activities can cause significant increases in sediment delivery. While mining may not be as geographically pervasive as other sediment-producing activities, surface mining typically increases sediment delivery much more per unit of disturbed area than other activities (Dunne and Leopold, 1978; USFS, 1980; Richards, 1982; Nelson et al. 1991) due to the level of disruption of soils, topography, and vegetation. Relatively small amounts of mining can increase sediment delivery significantly."

References

Armour, C.L., D.A. Duff, and W. Elmore. 1991. The effects of livestock grazing on riparian and stream ecosystems. Fisheries vol 16:1, 7-11.

Bureau of Land Management. 1992. Whitehorse Butte Allotment biological assessment, Vale District, Oregon. 24 p.

Chamberlin, T.W., Harr, R.D., and F.H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. American Fisheries Society Special Publication 19:181-205.

Chaney, E., W. Elmore, and W. S. Platts. 1990. Livestock grazing on western riparian areas. Report prepared for the U.S. Environmental Protection Agency by Northwest Resources Information Center, Inc., Eagle, ID. 45 p.

Columbia River Inter-Tribal Fish Commission. 1994 A coarse Screening Process For Potential Application in ESA Consultations. Available from National Marine Fisheries Service, Portland, Oregon

Furniss, M.J., Roelofs, T.D., and C.S. Lee. 1991. American Fisheries Society Special Publication 19:297-323.

Gordon, N.D., McMahon, T.A., and B.L. Finlayson. 1992. Stream hydrology, an introduction for ecologists. John Wiley &Sons Ltd., England.

Johnson, O.W., R.S. Waples, T.C. Wainwright, K.G. Neely, F.W. Waknitz, and L.T. Parker. 1994 Status Review for Oregon's Umpqua River Sea-Run cutthroat Trout. NOAA Technical Memorandum NMFS-NWFSC-15. Available from NMFS/NFSC/CZES 2725 Montlake BLvd. E. Seattle, WA 98112-2097

Madej, M.A. 1982. Sediment transport and channel changes in an aggrading stream in the Puget Lowland, Washington. U.S. Forest Service General Technical Report PNW-141:97-108.

Meehan, W.R. 1991. Introduction and overview. P. 1-15 in Meehan ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Soc., Bethesda, MD. 751 p.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1994. Draft section 7 endangered species consultation handbook--procedures for conducting section 7 consultations and conferences. 59 Federal Register 65781. December 21.

Odum, E.P. 1981. The effects of stress on the trajectory of ecological succession. In Barrett and Rosenberg eds. Stress effects on natural ecosystems. John Wiley and Sons Ltd., New York, NY. 305 p.

O'Loughlin, C.L. 1972. An investigation of the stability of the steepland forest soils in the Coast Mountains, southwest British Columbia. Doctoral dissertation. University of British Columbia, Vancouver.

Packer, P.E. 1967. Forest treatment effects on water quality. Pages 687-699 in: Sopper, W.E. and H.W. Lull (eds). Forest hydrology; proceedings, forest hydrology seminar. Pergamon Press, New York.

Platts, W.S. 1989. Compatibility of livestock grazing strategies with fisheries. In Gresswell, Barton, and Kershner eds. Practical approaches to riparian resource management. U.S. Bureau of Land Management, Billings, MT. 193 p.

Platts W.S.. 1991. Livestock grazing. American Fisheries Society Special Publication 19:389-424.

Rhodes, J. J., D.A. McCullough, F.A. Espinosa. 1994 A Coarse Screening Process For Potential Application In ESA Consultations. Columbia River Inter-Tribal Fish Commission, 729 NE Oregon, Suite 200, Portland, OR 97232

Scrivener, J.C. 1988. Changes in composition of the streambed between 1973 and 1985 and the impacts on salmonids in Carnation Creek. Pages 59-65 in: Chamberlin, T.W. (ed) 1988. Applying 15 years of Carnation Creek results. Proceedings of a workshop. Pacific Biological Station, Carnation Creek Steering Committee, Nanaimo, British Columbia.

Appendix B
Species Narrative

Umpqua River Sea-Run Cutthroat Trout (*Oncorhynchus clarki*)

Endangered Species Act Status:	Proposed Endangered, July 8, 1994, Umpqua River Basin, in Southwestern Oregon. All life forms are included in this proposal.

Description. Sea-run cutthroat trout is a profusely spotted fish which often has red or sometimes orange slash marks on each side of the lower jaw. Coastal sea-run cutthroat trout often lose the cutthroat marks when in seawater. Some other trouts, such as Apache trout, Gila trout and Redband trout may also have yellowish or red slash marks. Other identifying marks include; the presence of basibranchial teeth, located on the basibranchial plate behind the tongue. The upper jaw is typically more than half the length of the head with the eye being well forward of the back of the maxilla.

The spots on cutthroat trout are small to medium, irregularly shaped, dispersed evenly over the entire body including the belly and anal fin. Coloration of sea-run fish is often silvery with a slight yellow tint. This silver coloration often masks the spots. Sea-run fish darken and take on spots after a period in freshwater. Freshwater fish are often more colorful with pale yellow colors on the body and red-orange or yellow on the lower fins. The gill plates sides and ventral areas may tinted a rosy color as spawning time draws nearer (description from Stolz and Schnell, 1991).

Distribution. Coastal cutthroat trout range from northern California to the Gulf of Alaska. The distribution of the proposed Umpqua River Sea-run cutthroat trout is the greater Umpqua River Basin located in Douglas County in southwestern Oregon. The Umpqua River Basin stretches from the Cascade Mountains in the east to the Pacific Ocean at Reedsport, Oregon.
The drainages of the North and South Umpqua Rivers together make up about 2/3 of the greater Basin drainage, and each river is about 170 km long. The mainstem Umpqua River flows in a northwesterly direction another 180 km to the ocean. Together, the three rivers form one of the longest coastal basins in Oregon, approximately 340 km in length, with a drainage area of over 12,200 sq. km. Major tributaries of the mainstem Umpqua River include Calapooya (River Kilometer [RKm] 164), Elk (RKm 78), and Scholfield Creeks (Rkm 18) and the Smith River (Rkm 18). The estuary of the Umpqua River is one of largest on the Oregon coast and has a large seawater wedge that extends as far inland as Scottsburg, Oregon at Rkm 45. (From Status Review For Oregon's Umpqua River Sea-Run Cutthroat Trout, Johnson et al. 1994)

Life Forms
Sea-Run (anadromous) cutthroat trout

Cutthroat trout have evolved to exploit habitats least preferred by other salmonid species (Johnston 1981). Unlike other anadromous salmonids, sea-run cutthroat trout do not over-winter in the ocean and only rarely make long extended migrations across large bodies of water. They migrate in the near-shore marine habitat and usually remain within 10 km of land (Sumner 1972, Giger 1972, Jones 1976, Johnston 1981). While most anadromous cutthroat trout enter seawater as 2- or 3-year-olds, some may remain in fresh water for up to 5 years before entering the sea (Sumner 1972, Giger 1972).

<u>Resident (nonmigratory) cutthroat trout</u>

Some cutthroat trout do not migrate long distances; instead, they remain in upper tributaries near spawning and rearing areas and maintain small home territories (Trotter 1989). Resident cutthroat trout have been observed in the upper Umpqua River drainage (Roth 1937, FCO and OSGC 1946 , ODFW 1993a)

During a radio tagging study Waters (1993) found that fish smaller than 180mm maintained home ranges of less than 14m of stream length and moved about an average of 27m during the study. Fish larger than 180mm had home ranges of about 76m and moved and average total distance of about 166m. This study was conducted in three tributaries of Rock Creek on the North Umpqua River drainage. (In Johnson et al. 1994)

<u>River-Migrating (Potamodromous) cutthroat trout</u>

Some cutthroat trout move within large river basins but do not migrate to the sea.

Life History/Migration.
The following descriptions are condensed from status review (Johnson et al. 1994)

Cutthroat trout spawning occurs between December and May and eggs begin to hatch within 6-7 weeks of spawning, depending on temperature. Alevins remain in the redds for a further few weeks and emerge as fry between March and June, with peak emergence in mid-April (Giger 1972, Scott and Crossman 1973). Newly emerged fry are about 25 mm long. They prefer low velocity margins, backwaters, and side channels, gradually moving into pools if competing species are absent. If coho fry are present they will drive the smaller cutthroat fry into riffles, where they will remain until decreasing water temperatures reduce the assertiveness of the coho fry (Stolz and Schnell, 1991). In winter , cutthroat trout go to pools near log jams or overhanging banks (Bustrad and Narver 1975).

Parr Movements
After emergence from redds, cutthroat trout juveniles generally remain in upper tributaries until they are 1 year of age, when they may begin extensive movement up and down streams.

Directed downstream movement by parr usually begins with the first spring rains (Giger 1972) but has been documented in every month of the year (Sumner 1953, 1962, 1972; Giger 1972; Moring and Lantz 1975; Johnston and Mercer 1976; Johnston 1981). As an example, from 1960 to 1963 (Lowry 1965) and from 1966 to 1970 (Giger 1972) in the Alsea River drainage, large downstream migrations of juvenile fish began in mid-April with peak movement in mid-May. Some juveniles (parr) even entered the estuary and remained there over the summer, although they did not smolt nor migrate to the open ocean (Giger 1972). In Oregon, upstream movement of juveniles from estuaries and mainstem to tributaries begins with the onset of winter freshets during November, December, and January (Giger 1972, Moring and Lantz 1975). At this time, these 1-year and older juvenile fish averaged less than 200 mm in length.

Smoltification

Time of initial seawater entry of smolts bound for the ocean varies by locality and may be related to marine conditions or food sources (Lowry 1965, 1966; Giger 1972; Johnston and Mercer 1976; Trotter 1989). In Washington and Oregon, entry begins as early as March, peaks in mid-May, and is essentially over by mid-June (Sumner 1953, 1972; Lowry 1965; Giger 1972; Moring and Lantz 1975; Johnston 1981). Seaward migration of smolts to protected areas appears to occur at an earlier age and a smaller size than to more exposed areas. On the less protected Oregon coast, cutthroat trout tend to migrate at an older age (age 3 and 4) and at a size of 200 to 255 mm (Lowry 1965, 1966; Giger 1972).

Timing of smolt migrations in the Umpqua River

Trap data from seven locations in the North Umpqua River in 1958 and from three locations in Steamboat Creek (a tributary of the North Umpqua River downstream of Soda Springs Dam) between 1958 and 1973 indicate that juvenile movement is similar to that reported by Lowry (1965) and Giger (1972) in other Oregon coastal rivers. Movement peaked in May and June, with a sharp decline in July, although some juveniles continued to be trapped through September and October. It is unknown whether Umpqua River cutthroat trout juveniles migrate from the upper basin areas to the estuary, but it seems unlikely considering the distance (well over 185 km) and the river conditions (average August river temperature at Winchester Dam (located on the main Umpqua River where the Interstate 5 highway crosses the Umpqua) since 1957 is 23.3°C) (ODFW 1993a).

Estuary and Ocean Migration

Migratory patterns of sea-run cutthroat trout differ from Pacific salmon in two major ways: few, if any, cutthroat overwinter in the ocean, and the fish do not usually make long open-ocean migrations, although they may travel considerable distances along the shoreline (Johnston 1981, Trotter 1989, Pauley et al. 1989). Studies by Giger (1972) and Jones (1973, 1974, 1975) indicated that cutthroat trout, whether initial or seasoned migrants, remained at sea an average of only 91 days, with a range of 5 to 158 days.

Adult Freshwater Migrations

In the Umpqua River, it is reported (ODFW 1993a) that cutthroat trout historically began upstream migrations in late June and continued to return through January with bimodal peaks in late-July and October. Giger (1972) reported a similar return pattern, but with slightly later modal peaks (mid-August and late-October to mid-November) on the Alsea River.

Spawning/Rearing

Cutthroat trout generally spawn in the tails of pools located in small tributaries at the upper limit of spawning and rearing sites of coho salmon and steelhead. Streams conditions are typically low stream gradient and low flows, usually less than 0.3 m^3/second during the summer (Johnston 1981). Spawn timing varies among streams, but generally occurs between December and May, with a peak in February (Trotter 1989).

Cutthroat trout are iteroparous and have been documented to spawn each year for at least 5 years (Giger 1972), although some cutthroat trout do not spawn every year (Giger 1972) and some do not return to seawater after spawning, but remain in fresh water for at least a year (Giger 1972, Tomasson 1978). Spawners may experience high post-spawning mortality due to weight loss of as much as 38% of pre-spawning mass (Sumner 1953) and other factors (Cramer 1940, Sumner 1953, Giger 1972, Scott and Crossman 1973).

Food.
In streams cutthroat trout feed mainly on terrestrial and aquatic insects that come to them in the drift. When in the marine environment cutthroat trout feed around gravel beaches, off the mouths of small creeks and beach trickles, around oyster beds and patches of eel grass. They primarily feed on amphipods, isopods, shrimp, stickleback, sand lance and other small fishes. (Stolz and Schnell, 1991)

Additional Information
Much of what is presented here was take from two sources. They are the Status Review for Oregon's Umpqua River Sea-Run Cutthroat Trout, June 1994, available from the National Marine Fisheries Service, Northwest Fisheries Science Center, Coastal Zone and Estuarine Studies Division, 2725 Montlake BLVD. E., Seattle, WA 98112-2097 and the book The Wildlife Series, Trout, Edited by Judith Stolz and Judith Schnell, Stackpole Books, Cameron and Kelker Streets, P.O. Box 1831, Harrisburg, PA 17105 (ISBN number 0-8117-1652-X). Both documents contain a lot more information for those that are interested.

Appendix C

A comparison between ACS Objectives, Ecological Goals, and the pathways and indicators used in the effects matrix.

Aquatic Conservation Strategy Objectives - Northwest Forest Plan	Ecological Goals - Snake River Recovery Plan/ LRMP	Pathways / Indicators
2,4,8,9	2,5,9,10	Water Quality / Temperature
4,5,6,8,9	5,6,7,9,10	Water Quality/Sediment./Turbidity.
2,4,8,9	2,5,9,10	Water Quality/Chemical Concentration/Nutrients
2,6,9	2,7,10	Habitat Access/ Physical Barriers
3,5,8,9	3,6,9,10	Habitat Elements/Substrate
3,6,8,9	3,4,7,9,10	Habitat Elements/Large Woody Debris
3,8,9	3,4,9,10	Habitat Elements/Pool Frequency
3,5,6,9	3,4,6,7,10	Habitat Elements/Pool Quality
1,2,3,6,8,9	1,2,3,7,9,10	Habitat Elements/Off-Channel Habitat
1,2,9	1,2,10	Habitat Elements/Refugia
3,8,9	3,9,10	Channel Condition/Dynamics/Width/Depth Ratio
3,8,9	3,9,10	Channel Condition/Dynamics/Streambank Condition
1,2,3,6,7,8,9	1,2,3,7,8,9,10	Channel Condition/Dynamics/Floodplain Connectivity.
5,6,7	6,7,8	Flow/Hydrology/Change in Peak/Base Flow
2,5,6,7	2,6,7,8	Flow/Hydrology/Increase in Drainage Network
1,3,5	1,3,6	Watershed Conditions/Road Density & Location
1,5	1,6	Watershed Conditions/Disturbance History
1,2,3,4,5,8,9	1,2,3,4,5,6,9,10	Watershed Conditions/Riparian Reserves

Appendix D
ACS Objectives and Ecological Goals

ACS Objectives

Forest Service and BLM-administered lands within the range of the northern spotted owl will be managed to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Ecological Goals

NMFS restated, refined, and expanded the PACFISH goals to provide added detail on ecological function needed for listed salmon and to include landscape and habitat connectivity perspectives. These goals provide consistency with NMFS' basin-wide Ecological Goals for all Federal land management agencies contained in the Proposed Recovery Plan for Snake River Salmon. Consistency with these goals will help NMFS determine whether land management actions avoid jeopardy or adverse modification of critical habitat during watershed-scale and project-scale consultations. However, although consistency with the goals and their associated guidelines generally is necessary to achieve informal concurrence under section 7 of the Endangered Species Act, concurrence cannot be guaranteed since the goals and other guidance were not structured to eliminate short-term adverse effects. Also, some of the guidelines (particularly with regard to grazing, mining, and how to proceed following watershed analysis) are not specific enough to eliminate the requirement for project-specific interpretation and analysis. The goals and guidelines described below do not include NMFS' long-term expectations for the eastside environmental impact statements. The Ecological Goals are as follows:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore timing, volume and distribution of large woody debris (LWD) recruitment by protecting trees in riparian habitat conservation areas. Addition of LWD to streams is inappropriate unless the causes of LWD deficiency are understood and ameliorated.

5. Maintain and restore the water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

6. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

7. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats, retain patterns of sediment, nutrient, and wood routing, and optimize the essential features of designated critical habitat. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows should be maintained, where optimum, and restored, where not optimum.

8. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

9. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

10. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.